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CHARLES DARWIN.

CHARLES DARWIN died on the 19th of April last, a few months after the completion of his 73rd year; and on the 26th, the mortal remains of the most celebrated man of science of the nineteenth century were laid in Westminster Abbey, near to those of Newton.

He was born at Shrewsbury, Feb. 12, 1809, and was named Charles Robert Darwin. But the middle appellation was omitted from his ordinary signature and from the title-pages of the volumes which, within the last twenty-five years, have given such great renown to an already distinguished name. His grandfather, Dr. Erasmus Darwin,—who died seven years before his distinguished grandson was born,—was one of the most notable and original men of his age; and his father, also a physician, was a person of very marked character and ability. His maternal grandfather was Josiah Wedgwood, who, beginning as an artisan potter, produced the celebrated Wedgwood ware, and became a Fellow of the Royal Society and a man of much scientific mark. The importance of heritability, which is an essential part of Darwinism, would seem to have had a significant illustration in the person of its great expounder. He was educated at the Shrewsbury Grammar School and at Edinburgh University, where, following the example of his grandfather, he studied for two sessions, having the medical profession in view, and where, at the close of the year 1826, he made his first contribution to natural history in two papers (one of them on the ova of *Flustra*). Soon finding the medical profession not to his liking, he proceeded to the University of Cambridge, entering Christ's College, and took his bachelor's degree in 1831; that of M.A. in 1837, after his return from South America.

It is said that Darwin was a keen fox-hunter in his youth,—not a bad pursuit for the cultivation of the observing powers. There is good authority for the statement—though it has nowhere been made in print—that at Cambridge he was disposed at one time to make the Church his profession, following the example of Buckland and of his teacher, Sedgwick. But in 1831, just as he was taking his bachelor's degree, Captain Fitzroy offered to receive into his own cabin any naturalist who was disposed to accompany him in the *Beagle's* surveying voyage round the world. Mr. Darwin volunteered his services without salary, with the condition only that he should have the disposal of his own collections. And this expedition of nearly five years—from the latter part of September, 1831, to the close of Octo-

ber, 1836 — not only fixed the course and character of the young naturalist's life-work, but opened to his mind its principal problems and suggested the now familiar solution of them. For he brought back with him to England a conviction that the existing species of animals and plants are the modified descendants of earlier forms, and that the internecine struggle for life in which these modifiable forms must have been engaged would scientifically explain the changes. The noteworthy point is that both the conclusion and the explanation were the legitimate outcome of real scientific investigation. It is an equally noteworthy fact, and a characteristic of Darwin's mind, that these pregnant ideas were elaborated for more than twenty years before he gave them to the world. Offering fruit so well ripened upon the bough, commending the conclusions he had so thoroughly matured by the presentation of very various lines of facts, and of reasonings close to the facts, unmixed with figments and *à priori* conceptions, it is not so surprising that his own convictions should at the close of the next twenty years be generally shared by scientific men. It is certainly gratifying that he should have lived to see it, and also have outlived most of the obloquy and dread which the promulgation of these opinions aroused.

Mr. Darwin lived a very quiet and uneventful life. In 1839 he married his cousin, Emma Wedgwood, who with five sons and two daughters survives him; he made his home on the border of the little hamlet of Down, in Kent, — “a plain but comfortable brick house in a few acres of pleasure-ground, a pleasantly old-fashioned air about it, with a sense of peace and silence;” and here, attended by every blessing except that of vigorous health, he lived the secluded but busy life which best suited his chosen pursuits and the simplicity of his character. He was seldom seen even at scientific meetings, and never in general society; but he could welcome his friends and fellow-workers to his own house, where he was the most charming of hosts.

At his home, without distraction and as continuously as his bodily powers would permit, Mr. Darwin gave himself to his work. At least ten of his scientific papers, of greater or less extent, had appeared in the three years between his return to England and his marriage; and in the latter year (1839) he published the book by which he became popularly known, viz., the “Journal of Researches into the Natural History and Geology of the Countries visited during the Voyage of the *Beagle*,” which has been pronounced “the most entertaining book of genuine travels ever written,” and it certainly is one of the most instructive. His work on “Coral Reefs” appeared in

1842, but the substance had been communicated to the Geological Society soon after his return to England; his papers on "Volcanic Islands," on the "Distribution of Erratic Boulders and Contemporaneous Unstratified Deposits in South America," on the "Fine Dust which falls on Vessels in the Atlantic Ocean," and some other geological as well as zoological researches, were published previously to 1851. Between that year and 1855 he brought out his most considerable contributions to systematic zoology, his monographs on the Cirripedia and the Fossil Lepadidæ.

We come to the first publication of what is now known as Darwinism. It consists of a sketch of the doctrine of Natural Selection, which was drawn up in the year 1839, and copied and communicated to Messrs. Lyell and Hooker in 1844, being a part of the manuscript of a chapter in his "Origin of Species;" also of a private letter addressed to the writer of this memorial in October, 1857,—the publication of which (in the Journal of the Proceedings of the Linnean Society, Zoological Part, iii. 45–53, issued in the summer of 1858) was caused by the reception by Darwin himself of a letter from Mr. Wallace, inclosing a brief and strikingly similar essay on the same subject, entitled "On the Tendency of Varieties to depart indefinitely from the Original Type." Mr. Darwin's action upon the reception of this rival essay was characteristic. His own work was not yet ready, and the fact that it had been for years in preparation was known only to the persons above mentioned. He proposed to have the paper of Mr. Wallace (who was then in the Moluccas) published at once, in anticipation of his own leisurely prepared volume; and it was only under the solicitation of his friends cognizant of the case that his own early sketch and the corroboratory letter were printed along with it.

The precursory essays of Darwin and Wallace, published in the Proceedings of a scientific society, can hardly have been read except by a narrow circle of naturalists. Most thoughtful investigating naturalists were then in a measure prepared for them. But toward the close of the following year (in the autumn of 1859) appeared the volume "On the Origin of Species by means of Natural Selection, or the Preservation of Favored Races in the Struggle for Life," the first and most notable of that series of duodecimos which have been read and discussed in almost every cultured language, and which within the lifetime of their author have changed the face and in some respect the character of natural history,—indeed have almost as deeply affected many other lines of investigation and thought.

In this Academy, where the rise and progress of Darwinian evolution have been attentively marked and its bearings critically discussed, and at this date, when the derivative origin of animal and vegetable species is the accepted belief of all of us who study them, it would be superfluous to give any explanatory account of these now familiar writings; nor, indeed, would the pages which we are accustomed to consecrate to the memory of our recently deceased Associates allow of it. Let us note in passing that the succeeding volumes of the series may be ranked in two classes, one of which is much more widely known than the other. One class is of those which follow up the argument for the origination of species through descent with modification, or which widen its base and illustrate the *modus operandi* of Natural Selection. Such are the two volumes on "Domesticated Animals and Cultivated Plants," illustrating Variation, Inheritance, Reversion, Interbreeding, &c.; the volume on the "Descent of Man, and Selection in Relation to Sex," — which extended the hypothesis to its logical limits, — and that "On the Expression of the Emotions in Man and the Lower Animals," published in 1872, which may be regarded as the last of this series. Since then Mr. Darwin appears to have turned from the highest to the lower forms of life, and to have entered upon the laborious cultivation of new and special fields of investigation, which, although prosecuted on the lines of his doctrine and vivified by its ideas, might seem to be only incidentally connected with the general argument. But it will be found that all these lines are convergent. Nor were these altogether new studies. The germ of the three volumes upon the Relation of Insects to Flowers and its far-reaching consequences, is a little paper, published in the year 1858, "On the Agency of Bees in the Fertilization of Papilionaceous Flowers, and on the Crossing of Kidney Beans"; the first edition of the volume on "The various Contrivances by which Orchids are Fertilized by Insects" appeared in 1862, thus forming the second volume of the whole series; and the two volumes "On the Effects of Cross- and Self-Fertilization in the Vegetable Kingdom," and "The Different Forms of Flowers on Plants of the same Species," which, along with the new edition of "The Fertilization of Orchids," were all published in 1876 and 1877, originated in two or three remarkable papers contributed to the Journal of the Linnean Society in 1862 and 1863, but are supplemented by additional and protracted experiments. The volume on "Insectivorous Plants," and the noteworthy conclusions in respect to the fundamental unity, and therefore common source, of vegetable and animal life, grew out of an observation which the

author made in the summer of 1860, when he "was surprised by finding how large a number of insects were caught by the leaves of the common Sun-dew (*Drosera rotundifolia*), on a heath in Sussex." Almost everybody had noticed this; and one German botanist (Roth), just a hundred years ago, had observed and described the movement of the leaf in consequence of the capture. But nothing came of it, or of what had been as long known of our *Dionæa*, beyond a vague wonderment, until Mr. Darwin took up the subject for experimental investigation. The precursor of his volume on "The Movements and Habits of Climbing Plants," published in 1875, as well as of the recent and larger volume on "The Power of Movement in Plants," 1880, was an essay published in the Journal of the Linnean Society in 1865; and this was instigated by an accidental but capital observation made by a correspondent, in whose hands it was sterile; but it became wonderfully fertile when touched by Darwin's genius.* His latest volume, on "The Formation of Vegetable Mould through the Action of Worms," is a development, after long years, of a paper which he read before the Geological Society of London in 1837.

These subsidiary volumes are less widely known than those of the other class; but they are of no less interest, and they are very characteristic of the author's genius and methods, — characteristic also of his laboriousness. For the amount of prolonged observation, watchful care, and tedious experiment they have demanded is as remarkable as the skill in devising simple and effectual modes of investigation is admirable. That he should have had the courage to undertake and the patience to carry on new inquiries of this kind after he had reached his threescore and ten years of age, and after he had attained an unparalleled breadth of influence and wealth of fame, speaks much for

* Mr. Darwin's quickness in divining the meaning of seemingly unimportant things, is illustrated in his study of *Dionæa*. Noting that the trap upon irritation closes at first imperfectly, leaving some room within and a series of small interstices between the crossed spines, but after a time, if there is prey within, shuts down close, he at once inferred that this was a provision for allowing small insects to escape, and for retaining only those large enough to make the long process of digestion remunerative. To test the surmise, he asked a correspondent to visit the habitat of *Dionæa* at the proper season, and to ascertain by the examination of a large number of the traps in action whether any below a certain considerable size were to be found in them. The result confirmed the inference. A comparatively trivial but characteristic illustration of Darwin's confidence in the principle of utility, and a good example of the truth of the dictum, which was by some thought odd when first made, namely, that Darwin had restored teleology to natural history, from which the study of morphology had dissevered it.

his energy and for his devotion to knowledge for its own sake. Indeed, having directed the flow of scientific thought into the new channel he had opened, along which the current set quicker and stronger than he could have expected, he seems to have taken up with fresh delight studies which he had marked out in early years, or topics which from time to time had struck his acute attention. To these he gave himself, quite to the last, with all the spirit and curiosity of youth. Evidently all this amount of work was done for the pure love of it ; it was all done methodically, with clear and definite aim, without haste, but without intermission.

It would confidently be supposed that in this case genius and industry were seconded by leisure and bodily vigor. Fortunately Darwin's means enabled him to control the disposition of his time. But the voyage of the *Beagle*, which was so advantageous to science, ruined his health. A sort of chronic sea-sickness, under which all his work abroad was performed, harassed him ever afterwards. The days in which he could give two hours to investigation or writing were counted as good ones, and for much of his life they were largely outnumbered by those in which nothing could be attempted. Only by great care and the simplest habits was he able to secure even a moderate amount of comfortable existence. But in this respect his later years were the best ones, and therefore the busiest. In them also he had most valuable filial aid. There was nothing to cause much anxiety until his seventy-third birthday had passed, or to excite alarm until the week before his death.

It may without exaggeration be said that no scientific man, certainly no naturalist, ever made an impression at once so deep, so wide, and so immediate. The name of Linnæus might suggest comparison ; but readers and pupils of Linnæus over a century ago were to those of Darwin as tens are to thousands, and the scientific as well as the popular interest of the subjects considered were somewhat in the same ratio. Humboldt, who, like Darwin, began with research in travel, and to whom the longest of lives, vigorous health, and the best opportunities were allotted, essayed similar themes in a more ambitious spirit, enjoyed equal or greater renown, but made no deep impression upon the thought of his own day or of ours. As one criterion of celebrity, it may be noted that no other author we know of ever gave rise in his own active lifetime to a special department of bibliography. Dante-literature and Shakespeare-literature are the growth of centuries ; but *Darwinism* had filled shelves and alcoves and teeming catalogues while the unremitting author was still supplying new and

ever novel subjects for comment. The technical term which he chose for a designation of his theory, and several of the phrases originated in explanation of it only twenty-five years ago, have already been engrafted into his mother tongue, and even into other languages, and are turned to use in common as well as in philosophical discourse, without sense of strangeness.

Wonderful indeed is the difference between the reception accorded to Darwin and that met with by his predecessor, Lamarck. But a good deal has happened since Lamarck's day ; wide fields of evidence were open to Darwin which were wholly unknown to his forerunner ; and the time had come when the subject of the origin and connexion of living forms could be taken up as a research rather than as a speculation. Philosophizers on evolution have not been rare ; but Darwin was not one of them. He was a scientific investigator, — a philosopher, if you please, but one of the type of Galileo. Indeed very much what Galileo was to physical science in his time, Darwin is to biological science in ours. This without reference to the fact that the writings of both conflicted with similar prepossessions ; and that the Darwinian theory, legitimately considered, bids fair to be placed in this respect upon the same footing with the Copernican system.

An English poet wrote that he awoke one morning and found himself famous. When this happened to Darwin, it was a genuine surprise. Although he had addressed himself simply to scientific men, and had no thought of arguing his case before a popular tribunal, yet "The Origin of Species" was too readable a book upon too sensitive a topic to escape general perusal ; and this, indeed, must in some sort have been anticipated. But the avidity with which the volume was taken up, and the eagerness of popular discussion which ensued, were viewed by the author, — as his letters at the time testify, — with a sense of amused wonder at an unexpected and probably transient notoriety.

The theory he had developed was presented by a working naturalist to his fellows, with confident belief that it would sooner or later win acceptance from the younger and more observant of these. The reason why these moderate expectations were much and so soon exceeded are not far to seek, though they were not then obvious to the world in general. Although mere speculations were mostly discountenanced by the investigating naturalists of that day, yet their work and their thoughts were, consciously or unconsciously, tending in the direction of evolution. Even those who manfully rowed against the current were more or less carried along with it, and some of them unwittingly

contributed to its force. Most of them in their practical studies had worked up to, or were nearly approaching, the question of the relation of the past inhabitants of the earth to the present, and of the present to one another, in such wise as to suggest inevitably that, somehow or other, descent with modification was eventually to be the explanation. This was the natural outcome of the line of thought of which Lyell early became the cautious and fair-minded expositor, and with which he reconstructed theoretical geology. If Lyell had known as much at first hand of botany or zoölogy as he knew of geology, it is probable that his celebrated chapter on the permanence of species in the "Principles" would have been reconsidered before the work had passed to the ninth edition in 1853. He was convinced that species went out of existence one by one, through natural causes, and that they came in one by one, bearing the impress of their immediate predecessors; but he saw no way to connect the two through natural operations. Nor, in fact, had any of the evolutionists been able to assign real causes capable of leading on such variations as are of well-known occurrence to wider and specific or generic differences. Just here came Darwin. When upon the spot he had perceived that the animals of the Galapagos must be modified forms derived from the adjacent continent, and he soon after worked out the doctrine of natural selection. This supplied what was wanting for the condensation of opinions and beliefs, and the collocation of rapidly accumulating facts, into a consistent and workable scientific theory, under a principle which unquestionably could directly explain much, and might indirectly explain more.

It is not merely that Darwin originated and applied a new principle. Not to speak of Wallace, his contemporary, who came to it later, his countryman, Dr. Wells, as Mr. Darwin points out, "distinctly recognizes the principle of natural selection, and this is the first recognition which has been indicated; but he applied it only to the races of men, and to certain characters alone." Darwin, like the rest of the world, was unaware of this anticipation until he was preparing the fourth edition of his "Origin of Species," in 1866, when he promptly called attention to it, perhaps magnifying its importance. However this be, Darwin appears to have been first and alone in apprehending and working out the results which necessarily come from the interaction of the surrounding agencies and conditions under which plants and animals exist, including, of course, their action upon each other. Personifying the *ensemble* of these and the consequences, — namely, the survival only of the fittest in the struggle for life, — under the term

of Natural Selection, Mr. Darwin with the instinct of genius divined, and with the ability of a master worked out its pregnant and far-reaching applications. He not only saw its strong points, but he foresaw its limitations, indicated most of the objections in advance of his opponents, weighed them with judicial mind, and where he could not obviate them, seemed never disposed to underrate their force. Although naturally disposed to make the most of his theory, he distinguished between what he could refer to known causes and what thus far is not referrible to them. Consequently, he kept clear of that common confusion of thought which supposes that natural selection originates the variations which it selects. He believed, and he has shown it to be probable, that external conditions *induce* the actions and changes in the living plant or animal which may lead on to the difference between one species and another; but he did not maintain that they *produced* the changes, or were sufficient scientifically to explain them. Unlike most of his contemporaries in this respect, he appears to have been thoroughly penetrated by the idea that the whole physiological action of the plant or animal is a response of the living organism to the action of the surroundings.

The judicial fairness and openness of Darwin's mind, his penetration and sagacity, his wonderful power of eliciting the meaning of things which had escaped questioning by their very commonness, and of discerning the great significance of causes and interactions which had been disregarded on account of their supposed insignificance, his method of reasoning close to the facts and in contact with the solid ground of nature, his aptness in devising fruitful and conclusive experiments, and in prosecuting nice researches with simple but effectual appliances, and the whole rare combination of qualities which made him *facile princeps* in biological investigation, — all these gifts are so conspicuously manifest in his published writings, and are so fully appreciated, that there is no need to celebrate them in an obituary memorial. The writings also display in no small degree the spirit of the man, and to this not a little of their persuasiveness is due. His desire to ascertain the truth, and to present it purely to his readers, is everywhere apparent. Conspicuous, also, is the absence of all trace of controversy and of everything like pretension; and this is remarkable, considering how censure and how praise were heaped upon him without stint. He does not teach didactically, but takes the reader along with him as his companion in observation and in experiment. And in the same spirit, instead of showing pique to an opponent, he seems always to regard him as a helper in his search for the truth.

Those privileged to know him well will certify that he was one of the most kindly and charming, unaffected, simple-hearted, and lovable of men.

How far and how long the Darwinian theory will hold good, the future will determine. But in its essential elements, apart from *à priori* philosophizing, with which its author had nothing to do, it is an advance from which it is evidently impossible to recede. As has been said of the theory of the Conservation of Energy, so of this: "The proof of this great generalization, like that of all other generalizations, lies mainly in the fact that the evidence in its favor is continually augmenting, while that against it is continually diminishing, as the progress of science reveals to us more and more of the workings of the universe."

[The outlines of a portion of this memorial, written on the day of Mr. Darwin's funeral, were printed in "The Literary World" of May 6.]

JOSEPH DECAISNE.

JOSEPH DECAISNE, the oldest member of the Botanical Section on the foreign list, died at Paris, on the 8th of February last, in the seventy-fifth year of his age. He was elected into this Academy in August, 1846, along with Agassiz and De Verneuil. He was born at Brussels, March 11, 1807, the second of three brothers, one of whom became a distinguished painter, and the other the head of the medical department of the Belgian army. He came to Paris and entered the Jardin des Plantes when a lad of seventeen years, and in its service his whole subsequent life was passed. The young *employé* attracted the attention of Adrien de Jussieu, who, seeing his promise and unusual botanical knowledge, soon placed him at the head of the seed department, and in 1833 made him his *Aide-naturaliste*, thus giving the young gardener opportunity for the studies and researches by which he won a place among the foremost botanists of the time. For more than forty years the administration of the Jardin des Plantes and the duties of the chair of Culture at the Museum were in his hands, he having supplied the place of Mirbel through the closing years of the latter's life, and succeeded him as professor in the year 1851; and these duties he continued to fulfil to the last. He was elected a member of the Institute in 1847, in succession to Dutrochet; for forty years he was one of the editors of, and since the death of his colleague, Adolphe Brongniart, he was the sole editor of the botanical portion of the "Annales des Sciences Naturelles." In the